TRACE FILTER ANALYSIS FOR CONTROLING HYDROLOGIC NETWORK DENSITY IRREGULARITIES IN RF3

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Purpose

The main task of this analysis is to highlight the importance of the trace filter settings in controlling hydrologic network density irregularities. Such irregularities may be observed throughout the country and are mainly due to differences among cartographers when preparing the hydrologic maps used to create the USGS DLG. Analyzing the effect of the available trace filters on the hydrologic network density may suggest ways to reduce this problem relatively easily. The following demonstrates the potential power of this feature based on an actual Nebraska Catalog Unit (CU 10200203).

Trace Filters in Waterbody Reach Indexing

The primary functions of the Waterbody System (WBS) are to assist states in reporting surface water assessment data for Section 305(b) of the Clean Water Act and to provide EPA with reliable water quality data for in-depth analysis of the states' water quality assessments. An important tool for linking waterbody location and water quality, and for creating GIS coverages and associated spacial analysis is the PC Reach File (PCRF). The PCRF Version 3.1 software has added new indexing techniques and flexibility in the geocoding process *(EPA WBS News Flash, Cycle 1994).* These capabilities for viewing and manipulating reach-related information are achieved mainly with the introduction of "trace filters". Grouped in two types, these filters give the user a variety of possibilities to chose from. Type I filters allow the user to focus indexing attention on specific sorts of traces. For instance, if the user wanted to work only with rivers, traces for the "miscellaneous" non-networked traces that appear in white on the map display and the traces associated with lakes that appear in brown could be filtered out . Type II filters deal with the full range of RF3 traces associated with the settings established under the Type I filters, or with some subset. For instance, the subset of RF3 associated with the older versions RF1 or RF2 could be selected.

Nebraska CU Trace Filter Analysis

Using PCRF Version 3.1, two screen captures of the Nebraska CU 10200203, namely, Case 1 and Case 2 are given below in Figures 1 and 2. The trace filters are chosen in the following manner. The Type I filter for both figures was set to Rivers/Streams only. This means that the observed hydrologic density difference is based solely on the Type II filter settings. In Case 1 we use option 3 of the Type II filter, which includes the reaches contained in RF1 and RF2 along with perennial reaches created and networked in RF3. In Case 2, the Type II filter was set to option 4, which adds intermittent reaches to the perennial ones.

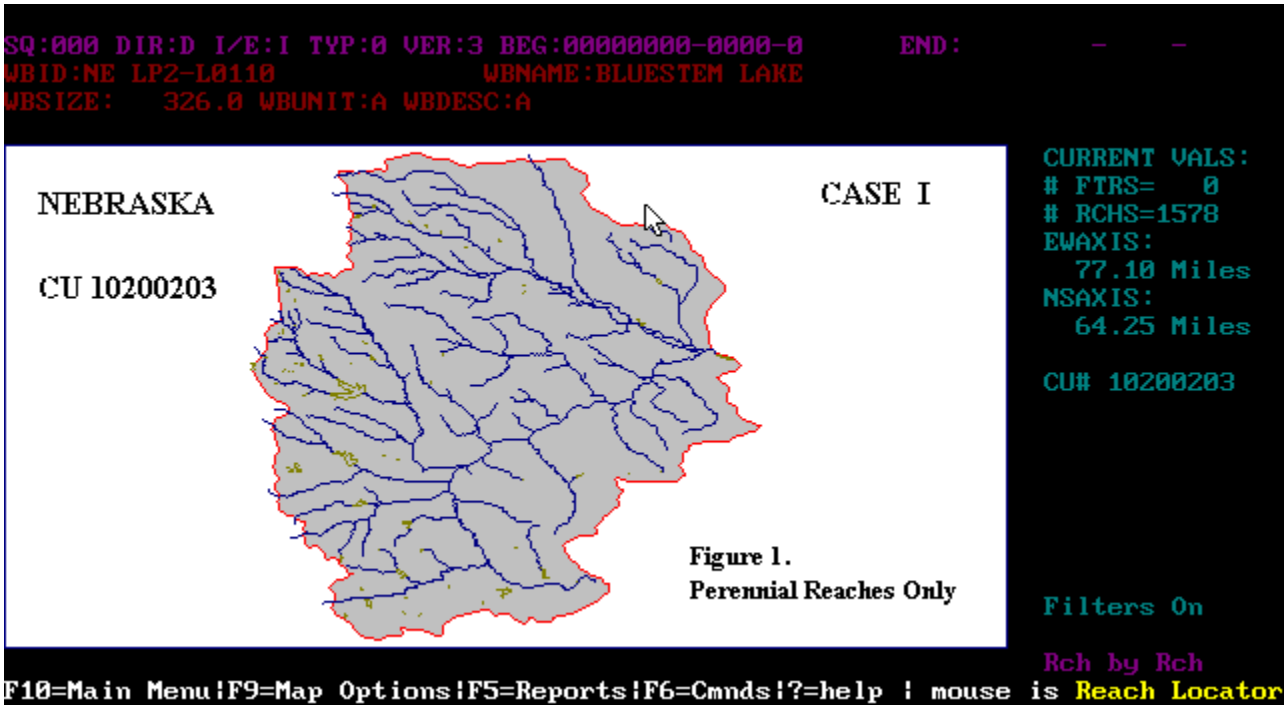

Figure 1. Nebraska CU 10200203 (Perennial Reaches Only)

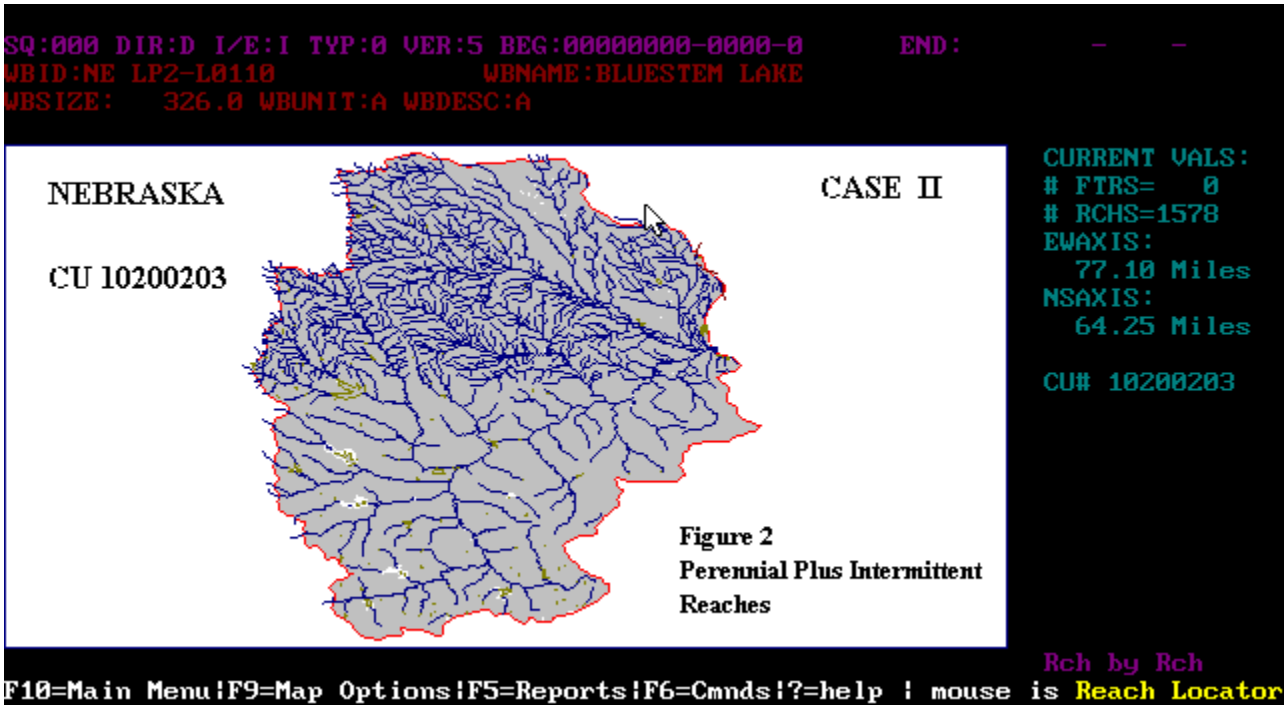

Figure 2. Nebraska CU 10200203 (Perennial Plus Intermittent Reaches)

To get a numeric characteristic of the hydrologic networked densities, two hypothetical waterbodies

have been defined, provisionally called "North WB" and "South WB". Applying the recently introduced POLYGON indexing method in PCRF3 software, the related reaches have been geocoded to the above defined North and South waterbodies. Making use of the PCRF3 reporting capabilities, we have estimated the hydrologic network density for both cases. The hydrologic density and the density ratios of the North versus the South waterbody are given in Table 1.

Table 1. Hydrologic Network Densities

Case I.	Type I filter: Rivers/Streams Only	
	Type II filter: Perennial Reaches Only	
"North WB"	Area:	801.54 sq.mi.
	Total Waters Length:	455.16 mi.
	Hydrologic Network Density:	0.57 mi/sq.mi.
"South WB"	Area:	863.05 sq.mi.
	Total Waters Length:	441.98 mi.
	Hydrologic Network Density:	0.51mi/sq.mi.

Hydrologic Network Density Ratio (North vs South "WB") equals to **1.11**

Case II.	Type I filter: Rivers/Streams Only	
	Type II filter: Perennial Plus Intermittent Reaches	
"North WB"	Area:	801.54 sq.mi.
	Total Waters Length:	1422.85 mi.
	Hydrologic Network Density:	1.78 mi/sq.mi.
"South WB"	Area:	863.05 sq.mi.
	Total Waters Length:	598.10 mi.
	Hydrologic Network Density:	0.69 mi/sq.mi.

Hydrologic Network Density Ratio (North vs South "WB") equals to **2.56**

Discussion

When working with river-type waterbodies, it may often be desirable to select only hydrologically networked perennial streams, which implies a Type II filter setting of 3. This option is illustrated for the Nebraska CU in Case I, perennial reaches only, and displayed on Figure I. No hydrologic network density difference between the North and South waterbody can be identified visually. This finding is very much in line with the calculated hydrologic density ratio of 1.11. If the intermittent streams are of interest, then Type II filter setting 4 will be appropriate. This case II, perennial plus intermittent reaches for the Nebraska CU, is given in Figure 2. In this screen capture we can clearly see the artificial hydrologic density difference occurring based on the two quad DLG USGS maps. The calculated hydrologic network density ratio of 2.56 confirms the large observed difference caused by the different survey accuracies of the two quad DLG USGS maps.

Perhaps the most important outcome from this analysis is that cartographic differences in the DLG and RF3 may not be significant when only perennial rivers and streams are considered.

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http://www.epa.gov/owow/monitoring/rf/filters.html